

## Orthographic variation as evidence for the development of the Linear B writing system

### Abstract

This paper investigates the issue of orthographic variation in the Linear B writing system in order to explore ways in which studying a writing system's orthographic conventions may shed light on the history of its development. Linear B was used in the palatial/administrative centres of Late Bronze Age Greece and Crete (c.1400-1200 B.C.E.) and records an early Greek dialect known as 'Mycenaean'. The writing system's structure and orthographic conventions permit flexibility in the spelling of particular phonological sequences: this paper discusses the varying orthographic representation of such sequences and shows that synchronic variation is common or even the norm in many cases. Investigating the factors which underlie this variation demonstrates the potential for a study of synchronic variation to illuminate a writing system's diachronic development; it also underlines the importance of analysing the ways in which writers actually choose to use writing systems in order to fully understand their development.

Keywords: writing system; Linear B; Bronze Age Greece; Mycenaean Greek; syllabary; orthography; orthographic variation

## 1. Introduction\*

The Linear B writing system, used primarily for writing administrative records on clay tablets in the Mycenaean palaces of Late Bronze Age Greece, presents a number of obstacles to the analysis of its diachronic development. The extant documents written in Linear B, whose language is an early dialect of Greek known as ‘Mycenaean’, date from between c.1400 and c.1200 B.C.E., giving a relatively short period of time over which this writing system’s use is attested, although it may well have been created significantly earlier than the date of its first known texts (see Palaima 1988a: 274-6). Linear B documents occur at multiple sites across Crete (e.g. Knossos and Chania) and mainland Greece (e.g. Pylos, Mycenae, and Thebes), but the chronological relationship between tablets from different sites or different locations within a single site is not always clear, making diachronic comparisons difficult (see Driessen 2008 and, on Knossos, Firth 2000-2001: 261-80). This paper therefore uses the example of Linear B to explore how the evidence of synchronic variation within the extant written documents (in this case, specifically orthographic variation) may contribute to the understanding of a writing system’s diachronic development: although the available evidence does not allow the reconstruction of the precise order in which different stages of development took place, it is nonetheless possible to analyse the general processes involved. This paper also emphasises the importance of considering a

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writing system's specific context(s) of use – for Linear B, the recording of administrative information relating to people and goods under the control of the Mycenaean palaces – and the ways its writers chose to use it in practice in order to fully understand its processes of development.

In order to explore these issues, I shall discuss the different types of orthographic variation which are permitted within the Linear B writing system and how such variation may have developed; I shall then analyse how this variation occurs in practice via a case-study of tablets from one particular Mycenaean palace, Pylos. This site, located in south-western mainland Greece, was chosen for this study because the majority of its c.1,000 Linear B tablets are securely associated with the palace's final destruction c.1200 BCE (Shelmerdine 2001: 373, n.277 and 381, n.325; Driessen 2008: 73; for a very small number of possible exceptions, see Palaima 1988b: 111-13, 169). Since Mycenaean administrative records were not intended for long-term preservation – they were written within administrative cycles lasting a year at most and then discarded when no longer needed (Bennet 2001: 27-30) – these tablets are all likely to have been written within a period of just a few months leading up to the palace's destruction.

This relatively large corpus of contemporaneous documents offers an opportunity to study the writing practices of a single community of writers, or 'scribes', 25 of whom have been identified at this site via palaeographic analysis (Palaima 1988b); note that the use of the traditional term 'scribes' is not intended to imply that the role or status of the writers of the Linear B texts (on which see Palaima 2011: 121-3) is necessarily similar to that of scribes in other contemporary cultures, such as the Near East or Egypt. The scribes at Pylos are designated by 'hand' numbers (e.g. H1 =

Hand 1) and divided into ‘classes’ of palaeographically similar scribes – Class i (H1-4, H6, H11-15), Class ii (H21-26, H31-34), and Class iii (H41-45). These classes have been suggested to relate to the training of scribes by different individuals (e.g. Palaima 1988b: 188-9), as has the occurrence of orthographic variation (Duhoux 1986); however, the question of reconstructing scribal training practices is beyond the scope of this paper (for a preliminary discussion see Judson 2017b).

The Linear B writing system contains both phonographic and ideographic components. The c.150 ideograms (so-called because, unlike logograms, they cannot be used in the same contexts as phonograms: Thompson 2012) are used to represent items whose quantities are being recorded. Since the current study is concerned with the orthography of phonological sequences, it will focus on the phonographic component of the writing system: this consists of a syllabary, whose 87 signs all represent open syllables. Table 1 gives the generally accepted, conventionalised transcriptions for each syllabogram, along with sound-values where these are not obvious from transcriptions such as *pu*<sub>2</sub> (note that this sign is usually assumed to represent /bu/ as well as the value given here, /p<sup>h</sup>u/: for arguments against the former value, see Judson 2017a).

| Core signs         |     |     |     |     | Extra signs                        |                            |                            |
|--------------------|-----|-----|-----|-----|------------------------------------|----------------------------|----------------------------|
| a                  | e   | i   | o   | u   | a <sub>2</sub> (ha)                | a <sub>3</sub> (ai)        | au                         |
| da                 | de  | di  | do  | du  | dwe                                | dwo                        |                            |
| ja                 | je  |     | jo  |     |                                    |                            |                            |
| ka                 | ke  | ki  | ko  | ku  |                                    |                            |                            |
| ma                 | me  | mi  | mo  | mu  |                                    |                            |                            |
| na                 | ne  | ni  | no  | nu  | nwa                                |                            |                            |
| pa                 | pe  | pi  | po  | pu  | pu <sub>2</sub> (p <sup>h</sup> u) | pte                        |                            |
| qa                 | qe  | qi  | qo  |     |                                    |                            |                            |
| ra                 | re  | ri  | ro  | ru  | ra <sub>2</sub> (rya, lya)         | ro <sub>2</sub> (ryo, lyo) | ra <sub>3</sub> (rai, lai) |
| sa                 | se  | si  | so  | su  |                                    |                            |                            |
| ta                 | te  | ti  | to  | tu  | ta <sub>2</sub> (tya)              | twe                        | two                        |
| wa                 | we  | wi  | wo  |     |                                    |                            |                            |
| za                 | ze  |     | zo  |     |                                    |                            |                            |
| Undeciphered signs |     |     |     |     |                                    |                            |                            |
| *18                | *19 | *22 | *34 | *47 | *49                                | *56                        |                            |
| *63                | *64 | *65 | *79 | *82 | *83                                | *86                        |                            |

Table 1: The Linear B syllabary

The ‘core’ syllabary contains 59 signs of *V* or *CV* structure (where *V* = vowel, *C* = consonant); in addition, there are 14 ‘extra’ signs (with *VV*, *CV*, or *CCV* structures), so called because they can be substituted for one or two core signs in some circumstances, as well as 14 ‘undeciphered’ signs whose sound-values are still uncertain (for an overview of the Linear B writing system, see Melena 2014).

Alternations between the extra signs and their equivalent core signs are the source of the majority of the orthographic variation seen in Linear B, and will form the focus of this paper.

Because closed syllables and consonant clusters are both frequent in Mycenaean Greek, writing this language in an open syllabary requires orthographic conventions for the representation of consonants which are not followed by vowels. The two available options – the omission of these consonants (referred to as ‘partial spelling’), or their representation in full using a *CV* syllabogram containing a ‘dummy’ vowel (referred to as ‘plene spelling’) – are both used in Linear B in different circumstances: for instance,

the word /tripos/ ‘tripod’ is spelt *ti-ri-po*, with plene spelling of the initial /t-/ and omission of the final /-s/ (for details of the representation of different types of consonant clusters in partial or plene spelling, see Woodard 1997: 10-15, 62-6). In addition, a comparison of the Linear B core syllabary with the phonological system of Mycenaean Greek (as reconstructed via a comparison of the Linear B evidence with classical Greek and reconstructed Proto-Indo-European phonology: Lejeune 1972; Bartoněk 2003: 131-48; Thompson 2010: 189-93) shows that the writing system does not fully distinguish between all of the Mycenaean Greek phonemes (Table 2).

| Mycenaean Greek phonemes |            | Linear B core signs                           |
|--------------------------|------------|---|
| Stops:                   | labial     | p p <sup>h</sup> b?                           |
|                          | dental     | t t <sup>h</sup> d                            |
|                          | velar      | k k <sup>h</sup> g                            |
|                          | labiovelar | k <sup>w</sup> k <sup>wh</sup> g <sup>w</sup> |
| Affricates?              |            | ts?, dz?                                      |
| Fricatives               | s          | s-  |
|                          | h          | —   |
| Nasals                   | m          | m-  |
|                          | n          | n-  |
| Liquids                  | r          | r-  |
|                          | l          | —   |
| Semivowels               | y?         | j-  |
|                          | w          | w-  |
| Vowels                   |            | a e i o u<br>ā ē ī ō ū                        |

Table 2: Mycenaean Greek phonology and the Linear B core syllabary<sup>1</sup>

In particular, Mycenaean Greek distinguished between plain voiceless, voiceless aspirated, and voiced stops at four points of articulation (labial, dental, velar, and labiovelar). These are generally represented in Linear B with a single series of signs for each point of articulation (conventionally transliterated with a letter corresponding to

<sup>1</sup> These are conventional approximations of these reconstructed phonemes’ probable phonetic values. /b/ may not have existed in Mycenaean Greek (Thompson 2005); the precise values of the voiced and voiceless phonemes represented by z- are debated (Bartoněk 2003: 142); and /y/ either had been recently lost or was in the process of being lost at the time of the extant tablets (Lejeune 1972: 169; Bartoněk 2003: 139).

the voiceless stop, e.g. *k*- = /k/, /k<sup>h</sup>/, /g/), although there is one main exception in that a separate *d*-series exists for the voiced dental /d/, with the *t*-series representing only /t/ and /t<sup>h</sup>/. In addition, the series conventionally transcribed *r*- represents both of the liquid phonemes of Mycenaean Greek, /r/ and /l/, while there is no systematic means of representing the phoneme /h/ or of distinguishing vowel length. The extra signs include some further exceptions to these conventions: for instance, the signs *pu*<sub>2</sub> and *a*<sub>2</sub> represent specifically /p<sup>h</sup>u/ (see p.4) and /ha/, respectively. However, these do not appear to be systematic – e.g. no further /hV/ or /p<sup>h</sup>V/ signs are currently known for certain, and in general, although most of the undeciphered signs are likely to belong to the group of extra signs, there are still far too few to have represented every possible Mycenaean Greek consonant cluster and every phoneme which was underrepresented by the core syllabary (see Judson 2016: 5-8, 13-14). Moreover, the extra signs are not necessarily used consistently, hence the existence of alternations between the different possible orthographic renderings of a given sequence.

The origin of this ambiguity in the representation of the Mycenaean Greek phonological system by Linear B is often attributed to the writing system's origin as an adaptation from Linear A, an earlier Cretan writing system which was used to write documents in a non-Greek (and probably non-Indo-European) language known as 'Minoan'. Although it is likely that many Linear A signs have similar sound-values to their Linear B counterparts (see most recently Steele & Meißner 2017), the Minoan language is still poorly understood and the documents in Linear A therefore remain largely undeciphered (for attempts to analyse the possible phonological and morphological features of Minoan, see, e.g., Duhoux 1989 and 1998; Davis 2014). It is frequently stated that the process of adapting Linear A to Linear B, although probably

carried out for the purpose of writing administrative records in Greek rather than Minoan, failed to make sufficient changes to the structure of Linear A for this purpose (e.g. Ventris & Chadwick 1973: 67; Bartoněk 2003: 106; Sharypkin 2008). However, this relies on the highly problematic assumption that precise and unambiguous phonological representation is a necessary feature for a writing system to be well-suited to writing texts in a particular language, and has been critiqued on the grounds that many features of the writing system as a whole (including the ideographic component, as well as aspects such as text layout) were clearly developed for the specific purpose of facilitating the creation of the administrative records for which Linear B was almost exclusively used (e.g. Consani 2016; Marazzi 2016).

In this paper I shall examine the two main types of extra signs, discussing their origins, uses, and distribution among the scribes of Pylos. For reasons of space, this will not be an exhaustive discussion, but will focus on a few signs from each group which are of especial interest for the issue of orthographic variation (discussion of all the extra signs, as well as other types of orthographic variation, will form part of a more complete future study of variation in the Linear B writing system. For a previous analysis of these and other types of orthographic variation at Pylos, which focuses on identifying scribal training groups through shared patterns of variation, see Duhoux 1986; on the use of core vs. extra signs in general, see also Panayotou 1987 and 1992). I shall show how studying synchronic patterns of orthographic variation involving these signs contributes to our understanding of the Linear B writing system's diachronic development, as well as to the refutation of its assumed 'inadequacy' for the purposes of writing records in Mycenaean Greek.



In the following discussion, all Linear B texts are taken from the most recent published editions (Pylos [PY]: Bennett & Olivier 1973; Knossos [KN]: Killen & Olivier 1989; Mycenae [MY]: Melena & Olivier 1991; Ayios Vasileios [HV]: Aravantinos & Vasilogamvrou 2012), and cited in the format ‘site prefix + series number + tablet number + line number’ (e.g. PY An 1.1 = line 1 on tablet 1 from Pylos, belonging to the An-series of personnel records; where a term appears throughout a particular series of texts, it is cited as, e.g., PY An-series). All phonological and semantic interpretations of Mycenaean words are given in accordance with Aura Jorro 1985-1993 unless otherwise specified. In transcriptions, underdots indicate uncertain readings, and ] and [ represent breaks before and after the text given, with any text shown outside the brackets being a restoration; in text references, uncertain readings are again indicated by underdots, and [ ] means that the text is partly or wholly restored.

## 2. ‘Doublet’ signs

The first sub-group of extra signs to be discussed is the ‘doublets’, which are used to specify a more precise value than is possible (or usual) using the core syllabary (see Duhoux 2008: 246-7). For instance, as mentioned above,  $a_2$  represents /ha/, otherwise represented only by  $a$  (e.g.  $pa-we-a_2 \sim pa-we-a$  /p<sup>h</sup>arweha/ ‘cloths’, neuter nominative/accusative plural),<sup>2</sup> and  $pu_2$  represents /p<sup>h</sup>u/, while  $pu$  can in principle represent any of /pu/, /p<sup>h</sup>u/, or /bu/ (? : see n.1), e.g.  $pu_2-ti-ja \sim pu-ti-ja$  /p<sup>h</sup>ut<sup>h</sup>iās/? (man’s name, nominative: on the identification of these as the same name, see Nakassis 2013: 89-92, 93-4, 139-40).<sup>3</sup> Other examples include  $ra_3$ , representing /rai/ or

<sup>2</sup>  $pa-we-a_2$ : KN Ld(2) 786.[B], 787.B, 788.[B] (H114); MY L 710.2 (-), Oe 127 (H55).  $pa-we-a$ : KN L-series.

<sup>3</sup>  $pu_2-ti-ja$ : PY An 656.13 (H1), Jn 601.3 (H2).  $pu-ti-ja$ : PY An 340.10 (H22), Qa 1294 (H15).

/lai/, otherwise spelt only with *ra*, since diphthongs in *-i* are not standardly represented in full at Pylos (e.g. *di-pte-ra*<sub>3</sub> ~ *di-pte-ra* /dip<sup>h</sup>t<sup>h</sup>erai/ 'hides', feminine nominative plural).<sup>4</sup> Although these signs have similar functions, their origins are quite different: *pu*<sub>2</sub> was inherited from Linear A (although its original value is probably unlikely to have been /p<sup>h</sup>/: if Linear A distinguished aspiration of stops, we might expect a more systematic distinction of these in Linear B, although this is not to say that the Minoan language necessarily lacked phonemic aspiration); *a*<sub>2</sub> was probably invented at a relatively early stage of Linear B, since it lacks a known Linear A correspondence but is widely found across different Mycenaean sites; and *ra*<sub>3</sub> appears to have been in use as a syllabogram solely at Pylos (the sign is also attested at Knossos, but only as an ideogram representing 'saffron'). All of them are, however, clearly useful in providing a less ambiguous written representation of particular Mycenaean Greek sequences or terms. A significant proportion of the corpus of attestations of *a*<sub>2</sub> (c.25%) is made up of neuter plural forms such as *pa-we-a*<sub>2</sub> (all such forms are *s*-stem nouns or adjectives, whose stem originally ended in /-s/, although between vowels this has become /h/ by the period of the Linear B tablets: e.g. \*/p<sup>h</sup>arwes-a/ > /p<sup>h</sup>arweh-a/); similarly, c.50% of the attestations of *ra*<sub>3</sub> appear in *a*-stem plural forms (those whose stems end in /-a/, e.g. *di-pte-ra*<sub>3</sub> /dip<sup>h</sup>t<sup>h</sup>era-i/; these may be masculine or feminine). These facts suggest that the clearer marking of particular morphological categories which were of especial importance to the Mycenaean documents – plural forms of nouns being key features of administrative texts consisting largely of lists of people, animals, and goods – may have been one

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<sup>4</sup> *di-pte-ra*<sub>3</sub>: PY Ub 1315.1 (H31). *di-pte-ra*: PY Ub 1318.1.1.1.2.3.4 (H32).

(amongst several) motivations behind the creation and use of these signs in Linear B (see Judson 2017c: 119-22).

However, such theoretical considerations of these signs' usefulness in representing phonemes or sequences which are not standardly represented with the core Linear B syllabary seem to some extent to clash with their actual patterns of use in alternation with the equivalent core signs, as will be seen in more detail in the following sections.

### 2.1 $pu_2$

Of the 9 different scribal hands at Pylos who have examples of  $pu_2$  attested, the majority have no identifiable examples of  $pu$  standing for /p<sup>h</sup>u/, as shown by Table 3. Note that in this and all subsequent tables, '?' indicates examples whose readings, interpretations, and/or scribal attributions are uncertain; such examples are generally excluded from the discussion, unless they are potentially of particular importance to the analysis.

| Scribe | $pu_2$ | $pu = /p^h u/$ |
|--------|--------|----------------|
| 1      | 10     |                |
| 2      | 7      | 2?             |
| 3      | 1      |                |
| 4      | 1      |                |
| 6      | 1?     |                |
| 15     | 1      | 1              |
| 21     |        | 1              |
| 22     |        | 1+1?           |
| 23     | 1      |                |
| 24     | 1      |                |
| 25     | 1      |                |
| 43     | 1      |                |

Table 3: examples of /p<sup>h</sup>u/ spelt with  $pu_2$  and  $pu$  at Pylos (token count)

The most securely identifiable examples of  $pu = /p^hu/$  come from alternations such as that mentioned on p.9 above,  $pu_2\text{-}ti\text{-}ja$  (H1, H2)  $\sim pu\text{-}ti\text{-}ja$  (H15, H22). One of the scribes who used  $pu$  for  $/p^hu/$  in this name, H15, is the only one to have certainly used both this spelling and  $pu_2$  (in the toponym  $a\text{-}pu_2\text{-}we$  [dative-locative], PY Qa 1294). H2 may have done the same, although this depends on the acceptance of etymological interpretations of the personal names  $pa\text{-}pu\text{-}so$  ( $/Pamp^husos/?$ , PY Jn 415.4) and  $pu\text{-}te\text{-}u$  ( $/P^huteus/$  or  $/Put^heus/?$ , PY Jn 431.12): such interpretations are particularly problematic in Linear B due to the ambiguity of the script and the high frequency of names with a probable non-Greek origin. Although the other scribes attested as using  $pu$  for  $/p^hu/$ , H21 and H22, have no known examples of  $pu_2$ , the numbers of examples involved are so small that it is impossible to say whether this is due to a real preference on their parts for the core spelling or simply to chances of attestation.

Overall, there seems to be a clear preference amongst the Pylian scribes for the use of  $pu_2$  to represent  $/p^hu/$ ; nonetheless, some variation is present both between different scribal hands and within the work of at least one scribe, H15, if not also H2.

## 2.2 $a_2$

The 154 certain examples of  $a_2$  are attributed to 16 different scribes (H1, H2, H6, H14, H15, H21, H22, H24, H25, H26, H31, H32, H34, H42, H43, H44). Of these scribes, at least 4 also have examples of the core sign  $a$  used for  $/ha/$ , identified through orthographic alternations, 3 of which occur within the same hand:

- H1:  $tu\text{-}we\text{-}a$  (PY Un 267.3)  $\sim tu\text{-}we\text{-}a_2$  (HV X 4.2) =  $/t^huweha/$  ‘aromatic substances’ (neuter nominative/accusative plural); cf. the numerous examples of other similar  $s$ -stem forms in  $-a_2$  (p.10).

- H2: *we-a-re-ja* (PY Ta 642.1) ~ *we-a<sub>2</sub>-re-jo* (PY Ta 714.1: also H2) = /wehaleya/, /wehaleynos/ 'decorated with crystal' (feminine/masculine nominative singular).
- H21: *a-ne-u-te* (PY Cn 40.7.13) ~ *a<sub>2</sub>-ne-u-te* (PY Cn 599.2: also H21) = toponym in /Ha-/. The suggestion that this use of *a<sub>2</sub>* is a mistake influenced by the presence of another toponym beginning with *a<sub>2</sub>*-, *a<sub>2</sub>-pa-tu-wo-te*, on the same tablet (Ilievski 1959: 121-2, n.40) is unlikely, since *a<sub>2</sub>-ne-u-te* actually precedes all the instances of *a<sub>2</sub>-pa-tu-wo-te*.
- H26: *we-]je-ke-a* (PY Wa 1148.2) ~ *we-je-ke-a<sub>2</sub>* (PY Sa 787.A, 791, 843: also H26) = obscure neuter nominative/accusative plural *s*-stem noun.

There are, on the other hand, no scribes with certain examples of *a* = /ha/ who have not also used *a<sub>2</sub>*. The number of examples of *a<sub>2</sub>* in any given hand is generally much larger than that of their examples of *a* = /ha/, as shown in Table 4 below. However, the fact that all the scribes with more than 5 examples of *a<sub>2</sub>* also have at least one instance of *a* = /ha/ suggests that the absence of the latter from hands with fewer examples of *a<sub>2</sub>* is due to chances of attestation and/or to our own inability to securely identify instances of this spelling. The evident preference of the Pylian scribes for the spelling *a<sub>2</sub>* is therefore a tendency, albeit a strong one, rather than a consistent usage.

| Scribe | $a_2$ | $a = /ha/$ |
|--------|-------|------------|
| 1      | 51+1? | 1+5?       |
| 2      | 18+1? | 1+6?       |
| 3      |       | 1?         |
| 6      | 1     |            |
| 14     | 2     |            |
| 15     | 4     |            |
| 21     | 10    | 2          |
| 22     | 2     |            |
| 24     | 2     |            |
| 25     | 1     |            |
| 26     | 7     | 1+2?       |
| 31     | 1     | 3?         |
| 32     | 1     |            |
| 34     | 1     |            |
| 42     | 1     |            |
| 43     | 5     | 2?         |
| 44     | 1     | 2?         |

Table 4: Examples of /ha/ spelt with  $a_2$  and  $a$  at Pylos (token count)

### 2.3 $ra_3$

Variation between the two possible spellings of the sequences /rai/ and /lai/ used at Pylos – the extra sign  $ra_3$  or the core spelling  $ra$  (or, when a vowel follows,  $ra-j-$ , with the  $j-$  denoting a subphonemic glide) – is even more common than that seen in the two cases already discussed. In fact, all of the 6 scribes with attested examples of  $ra_3$  (H1, H2, H4, H21, H31, H41) also have at least one certain or highly probable example of  $ra$  = /rai/ or /lai/, as shown in Table 5.

| Scribe | <i>ra</i> <sub>3</sub> | <i>ra</i> (-j) = /rai/ or lai/ |
|--------|------------------------|--------------------------------|
| 1      | 8                      | 13+4?                          |
| 2      | 3                      | 3+1?                           |
| 3      |                        | 1                              |
| 4      | 1                      | 1                              |
| 12     |                        | 2+1?                           |
| 14     |                        | 3?                             |
| 21     | 1                      | 4+1?                           |
| 26     |                        | 3                              |
| 31     | 1                      | 1                              |
| 32     |                        | 7                              |
| 41     | 1                      | 1+4?                           |
| 42     |                        | 2                              |
| 44     |                        | 1+1?                           |

Table 5: Examples of /rai/ and /lai/ spelt with *ra*<sub>3</sub> or *ra*(-j) at Pylos (token count)

H1, for instance, who has 8 examples of *ra*<sub>3</sub> (a relatively high number considering that this sign is attested no more than 22 times in the whole corpus), also has 3 probable examples of *ra* = /rai/ or /lai/ (as well as at least 10 of *ra*-j- before a following vowel, an environment in which *ra*<sub>3</sub> never seems to be used), even spelling a single term as both *o-ka-ra*<sub>3</sub> (PY An 519.4, 654.18, 657.4) and *o-ka-ra* (PY An 657.13): although this term's precise interpretation is unclear, it is a noun referring to a group of soldiers, and the entry of 30 men following *o-ka-ra* guarantees that this, like *o-ka-ra*<sub>3</sub>, is a plural in /-ai/. Even other hands which have only two identifiable examples of /rai/ or /lai/ in total are attested as using both spellings: a particularly striking example is the phrase *di-pte-ra*<sub>3</sub> *e-ru-ta-ra* /dip<sup>ht</sup>herai erut<sup>ht</sup>rai/ 'red hides' (PY Ub 1315.1, H31) in which both spellings are used in a single entry consisting of two words in concord. Variation between these two spellings thus appears to be regular to an even greater extent than that seen in the cases of *pu*<sub>2</sub> and *a*<sub>2</sub>.

### 3. 'Complex' signs

The other main type of extra signs, known as 'complex' signs, represent consonant clusters which would otherwise be written with sequences of two core signs (see Duhoux 2008: 246-7). This section will focus on the group of five complex signs which represent /Cw/ clusters, for which up to three different spellings are available: for example, the sequence /dwe/ may be written in plene spelling as either *de-we* or *du-we* – i.e. with the dummy vowel being either the same as the following vowel (as is usual, cf. *ti-ri-po* /tripos/) or *u* in anticipation of the following /w/ – or with the extra sign *dwe*.

These complex signs have various patterns of usage. *nwa*, for instance, representing a consonant cluster, /nw/, which was probably infrequent in Mycenaean Greek, is in practice almost exclusively used in names of probable non-Greek origin. *twe* and *two*, in principle representing the clusters /tw/ and /t<sup>h</sup>w/, are each found only in a single scribal hand (H130 at Knossos and H43 at Pylos, respectively) and used in only a single term: the adjective *o-da-twe-ta* /odatwenta/ 'fitted with teeth' (neuter nominative/accusative plural, describing a type of chariot wheel: KN So-series) and the man's name *o-two-we-o* /Or<sup>h</sup>wōwehos/ (genitive: found 4 times on a single tablet, PY An 261.2-5. This name is also spelt with *tu-wo*, e.g. PY Jn 658.7 [H21], and *to-wo*, e.g. PY An 261 v.7 [H1]). *dwe* is similarly found predominately in the wheel-related adjective *te-mi-dwe(-te, -ta)* /termidwens/, /termidwente/, /termidwenta/ 'fitted with endings' (neuter nominative/accusative singular, dual, and plural: KN So-series; PY Sa 791, 793) but is distributed across multiple sites. The other sign representing the cluster /dw/, *dwo*, has a similarly wide geographical distribution and is also found in a range of terms including vocabulary items and personal names: examples from Pylos include



the numeral *dwo* /dwo/ ‘two’ (nominative/accusative: PY Eb 338.B, Eo 278 [H41]; Ub 1315.3 [H31]) and the man’s name *wi-dwo-i-jo* /Widwohios/ (nominative: PY Ep 539.12 [H1]).

Again, like the doublets, these complex signs have a variety of different origins: *nwa* is certainly inherited from Linear A, while *dwe*, *dwo*, and *two* are almost certainly Linear B creations, as *twe* may well also be. The use of these signs similarly seems in principle to have clear potential benefits in making the writing of such clusters both less ambiguous (since, for instance, the orthographic sequence *de-we* could represent disyllabic /dewe/ as well as /dwe/) and more efficient, in terms of the time and space required to write a particular term (see Judson 2017c: 115-18, 123-4). However, as in the case of the doublet signs discussed above, there is still considerable variation in the use of these complex signs vs. the two different possible plene spellings (of the form  $CV_1-wV_1$  or  $Cu-wV$ ) corresponding to each of them. Table 6 below shows the spelling of all the certain or possible examples of /Cw/ sequences from Pylos which are attributed to scribal hands, along with each hand’s total number of tablets and total number of identified examples of this type of sequence. The attested sequences include /dw/, /Kw/, /nw/, /sw/, and /Tw/ (where /Kw/ = /kw/, /k<sup>h</sup>w/, or /gw/ and /Tw/ = /tw/ or /t<sup>h</sup>w/: since these are not distinguished graphically they are treated as a single category here); although /Rw/ is also attested in Mycenaean Greek this is omitted as it is normally represented by partial spelling (e.g. *ko-wa* /korwā/ ‘girl’).

| Hand | /dw/   | /Kw/                             | /nw/  | /sw/                                 | /Tw/                              | Tablets | /Cw/ e.g.s |
|------|--|----------------------------------|---|--------------------------------------|-----------------------------------|---------|------------|
| 1    | <i>da-wa</i> 1<br><i>do-wo</i> 1<br><i>du-wo</i> 3<br><i>dwo</i> 1 | <i>ku-wo</i> 1?                  | <i>no-wo</i> 2?<br><i>nu-wo</i> 1+1?<br><i>nu-wa</i> 1?<br><i>nwa</i> 2 | <i>si-wi</i> 2+1?<br><i>su-we</i> 1? | <i>to-wo</i> 2<br><i>tu-wo</i> 1? | 237-42  | 13+8?      |
| 2    | <i>du-wa</i> 1?<br><i>de-we</i> 4+1?<br><i>du-wo</i> 2             | <i>ke-we</i> 1<br><i>ku-we</i> 3 | <i>no-wo</i> 1?<br><i>nu-wo</i> 4+2?<br><i>nu-wa</i> 2+1?               | <i>si-wi</i> 2                       | <i>tu-wo</i> 1                    | 86-7    | 19+6?      |
| 3    |  |                                  | <i>no-wo</i> 1?<br><i>nu-wo</i> 1                                       |                                      |                                   | 15      | 1+1?       |
| 12   |  |                                  |   |                                      | <i>to-wo</i> 1                    | 2       | 1          |
| 15   |  |                                  | <i>no-wo</i> 1  |                                      |                                   | 23      | 1          |
| 21   | <i>de-we</i> 1<br><i>do-wo</i> 1?                                  | <i>ko-wo</i> 1                   | <i>no-wo</i> 1?<br><i>nwa</i> 1   | <i>si-wi</i> 1?                      | <i>tu-wo</i> 5                    | 71      | 8+3?       |
| 22   | <i>do-wo</i> 1   |                                  |   |                                      |                                   | 5       | 1          |
| 23   |  | <i>ko-wo</i> 1                   | <i>nwa</i> 1  | <i>si-wi</i> 1?                      |                                   | 40-41   | 2+1?       |
| 26   | <i>de-we</i> 1?<br><i>dwe</i> 2                                    | <i>ko-wo</i> 1                   |   |                                      |                                   | 33-35   | 3+1?       |
| 31   | <i>dwo</i> 1   |                                  |   |                                      |                                   | 2       | 1          |
| 32   |  |                                  | <i>nu-wa</i> 1<br><i>nwa</i> 1  |                                      |                                   | 3       | 2          |
| 41   | <i>du-wo</i> 2<br><i>dwo</i> 2                                     |                                  |   |                                      |                                   | 109     | 4          |
| 43   |  |                                  | <i>nwa</i> 1  |                                      | <i>two</i> 4                      | 70      | 5          |

Table 6: scribes' orthographic representation of /Cw/ clusters at Pylos (token count)

As can be seen, H1 and H2, two of the most prolific scribes at Pylos, have the widest variety of relevant spellings, which correlates with their relatively high numbers of examples of /Cw/ clusters. H1, for instance, has used all three possible spellings of /dwo/<sup>5</sup> and probably also both possible spellings of /nwo/<sup>6</sup> (this hand's possible examples of *su-we* = /swe/? and *tu-wo* = /two/? are much more insecure in their interpretations and so will not be included here), while H2 has used two different

<sup>5</sup> E.g. *ne-do-wo-ta-de* /Nedwonta-de/, toponym (accusative plus allative particle), PY An 661.13; *du-wo-jo-jo* /Dwoioio/, man's name (genitive), PY An 656.11; *wi-dwo-i-jo* /Widwohios/, man's name (nominative), PY Ep 539.12.

<sup>6</sup> E.g. *ke-se-nu-wo* /Ksenwōn/, man's name (nominative)?, PY Cn 286.1; *e-ri-no-wo-to*, toponym probably of the form /-n-wontos/ (genitive), PY Eq 213.3.

spellings of /dw/,<sup>7</sup> /Kw/,<sup>8</sup> and probably /nw/.<sup>9</sup> There are also scribes with far fewer examples of /Cw/ sequences who are nonetheless attested as varying in their spelling of those sequences, even within forms of the same lemma: e.g. H32 has both *pe-ru-si-nu-wa* and *pe-ru-si-nwa-o* (/perusinwai/, /perusinwāhōn/: ‘this year’s’, feminine nominative/genitive plural: PY Ub 1316; Ub 1317); H41 has both *dwo* and *du-wo-u-pi* (/dwo/, /dwoup<sup>hi</sup>/: ‘two’, accusative and instrumental: PY Eb 338.B, Eo 278; Eb 149.2, 495.1); H26 may have both *te-mi-dwe-ta* and *te-mi-de-we-te* (PY Sa 791, 793; Sa 1266.a?; see p.16), if the uncertain attribution of Sa 1266 to this scribal hand is correct (Palaima 1988b: 91-4). The high degree of variation displayed by H1 and H2 demonstrates that the lower frequency of this variation in less prolific hands is due purely to its lower chances of attestation in their smaller numbers of tablets: all of these scribes appear to have had access to, and to have employed, the same range of orthographic choices. (A more detailed examination of the patterns seen in the use of these various different spellings, especially in the corpora of H1 and H2, and a comparison of these to the scribes’ use of other orthographic variants, is beyond the scope of this paper but will be discussed in a future comprehensive study of writing practices at Pylos).

The only instances in which scribes appear to have been consistent in the spelling of a particular sequence, over a reasonably large number of examples, are H21’s representation of /two/ as *tu-wo* (*a<sub>2</sub>-pa-tu-wo-te*, toponym of the form

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<sup>7</sup> E.g. *pe-de-we-sa* /pedwessa/ ‘fitted with feet’ (feminine nominative singular), PY Ta 709.2; *wi-du-wo-i-jo* /Widwohios/, man’s name (nominative), PY Jn 415.3.

<sup>8</sup> *pa-ra-ke-we* (PY Ta 642.1) ~ *pa-ra-ku-we* (PY Ta 714.1.3, 715.3), obscure noun in /-K-wei/ or /-K-wē/ (dative or instrumental singular).

<sup>9</sup> E.g. *pe-ru-si-nu-wo* /perusinwon/ ‘last year’s’ (neuter nominative/accusative singular), PY Ma-series; *e-ri-no-wo-te*, toponym probably of the form /-n-wontei/ (dative-locative), PY Mn 456.8 (cf. n.6).

/-T-wontei/ [dative-locative], PY Cn 599.3.4.5.7; *o-tu-wo-we* /Ort<sup>h</sup>wōwēs/, man's name [nominative], PY Jn 658.7) and H43's use of *two* four times in the same name, *o-two-we-o* /Ort<sup>h</sup>wōwehos/ (see p.16). Despite having written 70 tablets, H43 has only one other example of a /CwV/ sequence (*ti-nwa-si-jo*, 'man from \**ti-nwa-to*' [masculine nominative singular?], PY Ea 810), so there is insufficient data to say whether their consistent use of extra signs in these cases reflects an overall preference for this type of spelling. However, H21 has examples of an extra sign (*ti-nwa-si-ja*, 'women from \**ti-nwa-to*' [feminine nominative plural], PY Ab 190.B) and CV<sub>1</sub>-wV<sub>1</sub> spellings (*ne-de-we-e* /Nedwehei/, toponym [dative-locative], PY Cn 595.3; *a-pu-ko-wo-ko* /ampukworgoi/ 'women working on headbands'? [feminine nominative plural], PY Ab 210.B) as well as the Cu-wV spelling *tu-wo*, and therefore shows no overall preference for a particular way of representing /Cw/ clusters. As far as the limited evidence for these clusters allows for analysis, then, it seems that variation is both permitted and frequent, even within the work of individual scribes, who may vary in their representation of /Cw/ clusters overall, of particular /Cw/ clusters or /CwV/ sequences, and even of specific words containing these sequences.

#### 4. Synchronic evidence and diachronic developments

The existence of the extra signs as part of the Linear B writing system seems to be linked to the kinds of structural issues the system faces in its representation of Mycenaean Greek which have led some scholars to deem it 'inadequate' for this purpose (pp.7-8). In particular, the creation of new extra signs within Linear B provides evidence that, at various stages of the writing system's development, some of its users engaged with, and created orthographic solutions to, issues such as the ambiguity

created by the under-representation of certain phonemes, or the greater inefficiency (and ambiguity) of using plene spelling to represent consonant clusters (pp.10-11, 17) – albeit only in the case of certain phonemes and clusters, and perhaps in a fairly ad-hoc manner (Judson 2017c: 123-4).

However, analysis of these extra signs' synchronic patterns of usage at Pylos demonstrates that such factors cannot have been the only ones at work. Although scribes do show a strong preference for the more precise extra signs  $a_2$  and  $pu_2$  over their equivalent core signs, variation between two or three different orthographic options appears to be entirely usual when representing /rai/ and /lai/ and /CwV/ sequences, regardless of the (in principle) greater precision and/or efficiency of  $ra_3$  and the CwV signs over their core equivalents. Moreover, some variation is still present even in the cases of  $a_2$  and  $pu_2$ , and it is also important to note that our inability to interpret many Linear B terms may have skewed the picture in these cases: there may well be further examples of  $pu = /p^h u/$  and  $a = /ha/$  which cannot currently be identified, so that the true rate of variation in the spellings of these sequences is potentially higher than that shown by the available evidence.

In general, not only did the extra signs not entirely replace their core equivalents, but the latter continued to be used alongside them as equally valid options, even within the same words and the work of the same individuals: as well as the potential motivations involved in the development of the extra signs, we must therefore also consider those underlying the retention and use of the extra signs' core equivalents. Issues such as potential ambiguity, or the time and space required to write two signs instead of one, may well still have contributed to the creation of some extra signs – but it is clear that in practice these issues were not so problematic that

scribes felt obliged to avoid them at all costs, or even to do so a majority of the time. Hence, also, the lack of a more systematic restructuring of the core Linear B writing system and its conventions for representing Mycenaean Greek, which in most instances therefore appear to have been perfectly adequate for the purposes of its users, the Mycenaean scribes. The persistence of these general conventions for the use of Linear B probably also provided an incentive towards the retention of core signs as orthographic options even when equivalent extra signs existed: since a sequence /Cai/ would in most cases be represented simply as *Ca*, this option was retained for /rai/ and /lai/ alongside *ra*<sub>3</sub>, and likewise for the plene representation of /CwV/ sequences, the use of a plain vowel sign for /hV/, and the use of a core CV sign for an aspirated stop. Both innovative and conservative impulses can therefore be seen to have played a part in the development of the Linear B writing system as attested in the extant tablets.

## 5. Conclusions

This analysis of synchronic orthographic variation in the Pylos Linear B tablets has shown different degrees of variation in the use of doublet and complex signs vs. their core equivalents; overall, however, at least some variation between the two or three available orthographic options appears to be entirely normal in all of these cases, both across the whole site and within the work of individual scribes. This necessitates a reconsideration of the reasons suggested for the creation and use of these extra signs, relating to decreasing ambiguity and increasing efficiency in the writing system's representation of certain features of Mycenaean Greek. These factors are still likely to have been important in these signs' original development; however, other factors such

as influence from the writing system's core structure and orthographic conventions, and the (evidently limited) degree to which issues such as ambiguity would in practice have caused difficulties, must also be taken into account in considering the writing system's overall development, in order to explain the persistence of orthographic variation between these extra signs and their core equivalents.

Further work will be needed to extend this study to other forms of orthographic variation at Pylos and other sites, as well as to compare cases where potential variation in practice rarely if ever takes place, in order to come to a full understanding of the Linear B orthographic system and its use by the Mycenaean scribes. However, this study has demonstrated how an analysis of synchronic variation can add to our understanding of a writing system's diachronic development, as well as underlining the need to analyse the way writers choose to employ a writing system in practice in order to fully understand it in the context of its original use.

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